

# One-step Self-assembly for Producing Graphene and Carbon Nanocapsules

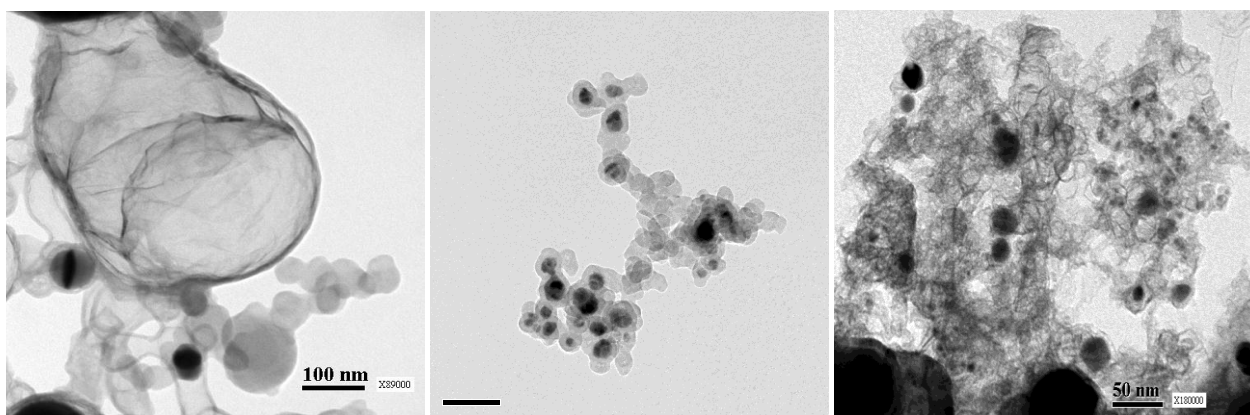
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**Abstract:** The 2D graphene and 3D carbon nanocapsules (CNCs) structures of extreme strength may offer excellent protection to their encapsulated nanomaterials for applications. This interest has been driven by the potential applications of the filled nanocapsules, which lie in areas as diverse as optical, electronic, magnetic recording materials and nuclear medicine. Graphene and carbon encapsulated nanocapsules have been synthesized by a self-heating detonation process using an energetic explosive for providing the need of high temperatures, high shock waves, and parts of carbon sources in the presence of metallic-containing catalysts. The detonation synthetic system can provide a unique environment and this gives a survival of the pre-fed catalyst and simultaneously a ready generation of the C<sub>n</sub> species. The experimental results show that the metal compounds can be converted into metallic nanoparticles due to the fast decomposition with a reduction reaction after the detonation and this will play an important role for the growth of graphene related to different structures of carbon nanocapsules. The systematic of experiments indicate that the nanoparticles encapsulated in concentric layers of graphitic carbon. Additionally, these results experimentally used in this study show that it is possible for a cheaper process with simple one-step and can be as an alternative compared to these high energy and hardware intensive processes to prepare these nanomaterials.

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**Figure 1:** TEM image for one-step detonation of energetic materials to form graphene and carbon encapsulated nanomaterials.